Problem Set 3

Organic Chemistry 1 (Greenberg)

Fall 2025

Roadmap:

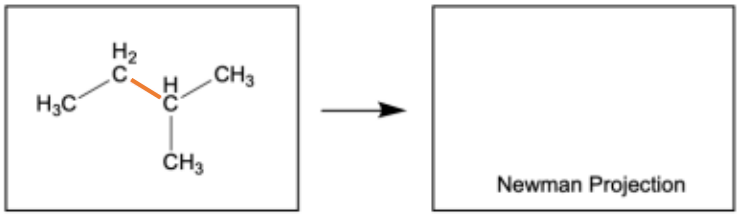
A. Conversion between: Newman projections, skeletal models, chairs

B. Energy to barrier of rotation for Newman projections: gauche/eclipses

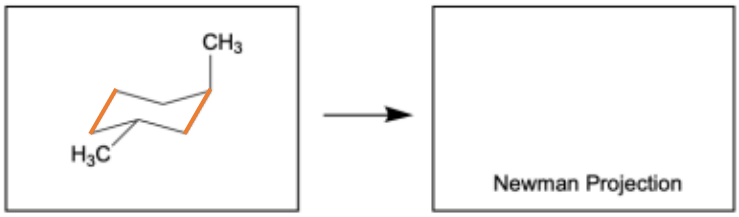
C. Stability of chair conformer: diaxial and gauche interactions

1. Please convert each molecule to the form indicated. Use the indicated bonds in orange to draw the Newman projections. For B and D, please name the relationship between the alkane groups (trans/cis).

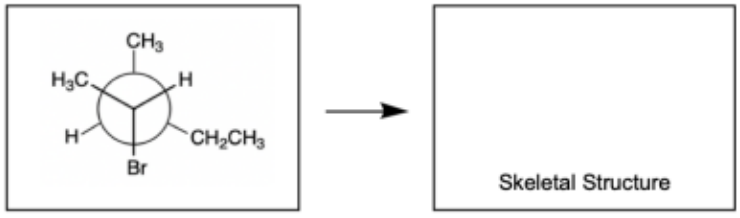
A



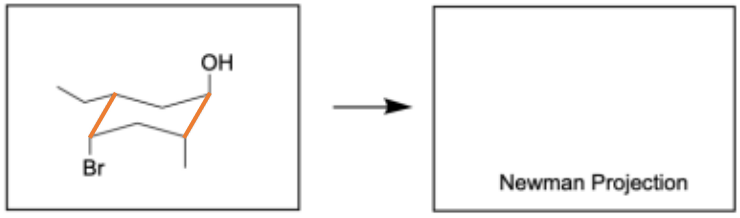
B



C

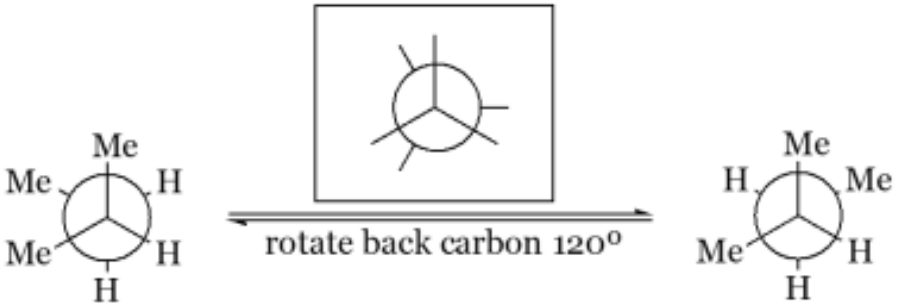


D

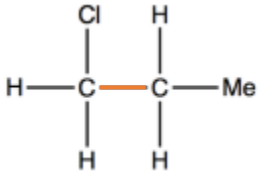


2. Draw the eclipsed intermediate, produced upon 60° rotation, and calculate the barrier rotation for the following transformation (i.e., the energy required to rotate from the given staggered conformation to the eclipsed conformation).

Interaction	kJ/mol
Me-Me gauche	3. 8
H-H eclipsed	4.0
Me-H eclipsed	6.0
Me-Me eclipsed	11.0

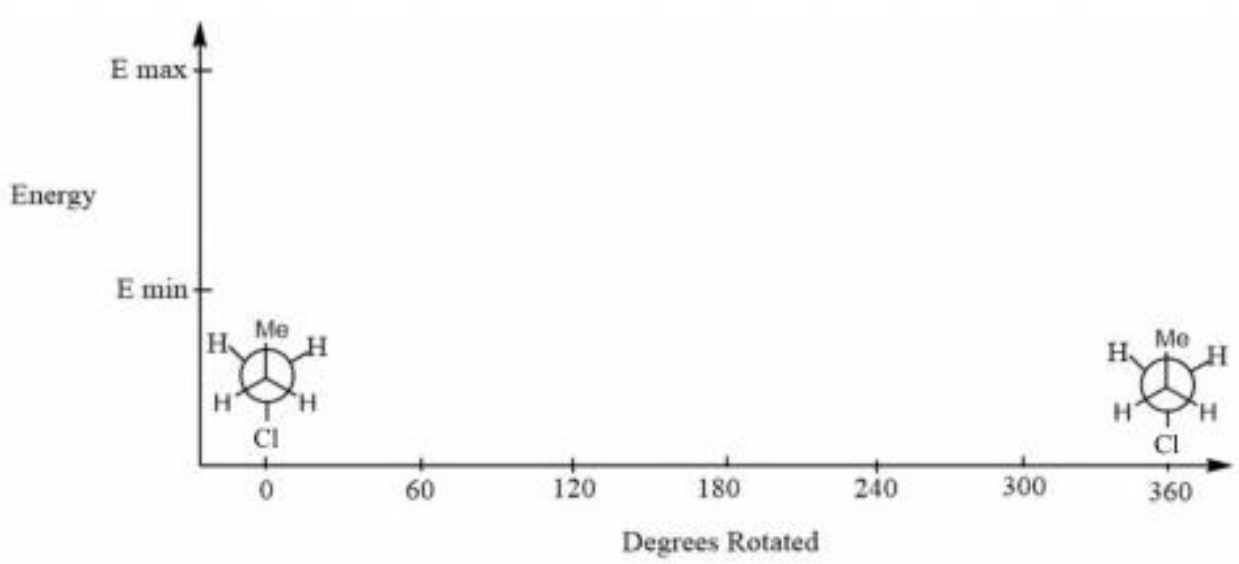


3. If you rotate along a single bond in a molecule, you can produce several different conformers, called rotational conformers.
   a. Draw all three staggered rotational conformers for the molecule, using the orange bond of interest (C1-C2) as the axis of rotation.

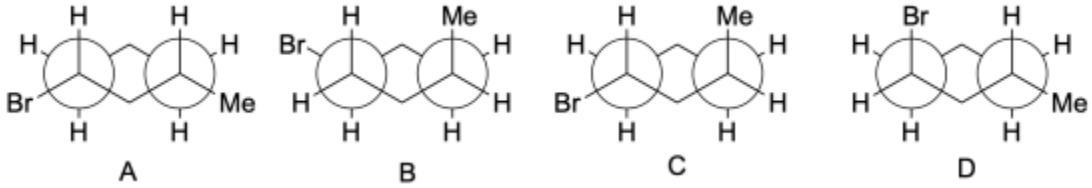


   b. Circle the most stable conformation of the ones you drew above. What is this conformation called?

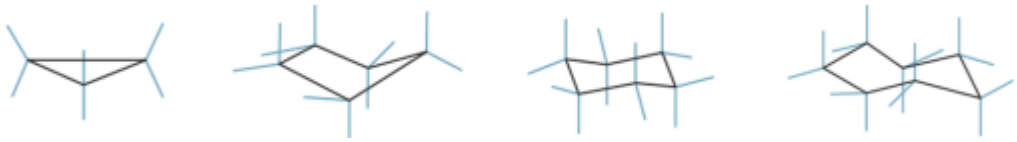
   c. On the provided graph, draw all the rotational conformers (staggered and eclipsed) on the graph at the indicated angles of rotation (0° and 360° have been provided). Draw the curve that reflects the energy differences between these conformers.



4. Which of the following Newman projects represents (1R,3R)-1-bromo-3-methylcyclohexane in its highest energy conformation?



5. Please label the cyclopropane, cyclopentane, cyclohexane, and cycloheptane. Which molecule is the most stable? Explain using your knowledge of hybridization and angle strain.



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Tip of the Week:

Important registration dates this semester: Sept. 5 is the deadline to add courses and waitlists at Homewood. Oct. 6 is both the deadline to drop a course and add independent academic work. Nov. 7 is both the deadline to withdraw ("W" on your transcript) as well as change any enrollment grading system to or from S/U. Find out more here: https://tinyurl.com/jhureg.